A.D. 1866, 2nd May. N° 1253.

SPECIFICATION

OF

JOHN BOTTERILL.

APPARATUS FOR CONSUMING SMOKE.

LONDON:
PRINTED BY GEORGE E. EYRE AND WILLIAM SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY:
PUBLISHED AT THE GREAT SEAL PATENT OFFICE,
25, SOUTHAMPTON BUILDINGS, HOLBORN.

Price 1s. [illegible]

1866.

A.D. 1866, *2nd May.* N° 1253.

Apparatus for Consuming Smoke.

LETTERS PATENT to John Botterill, of Leeds, in the County of York, Dyer, for the Invention of "Improvements in Apparatus for Consuming Smoke."

Sealed the 24th October 1866, and dated the 2nd May 1866.

PROVISIONAL SPECIFICATION left by the said John Botterill at the Office of the Commissioners of Patents, with his Petition, on the 2nd May 1866.

I, John Botterill, of Leeds, in the County of York, Dyer, do hereby declare the nature of the said Invention for "Improvements in Apparatus for Consuming Smoke," to be as follows:—

This Invention consists in fixing cast-iron or other pipes in the flue, fire-box, or other most convenient part of the furnace. The pipes or passages are so constructed as to admit air at one end at the opening; at the other end or outlet is attached a hollow box or chamber to receive the air after it has passed through the pipes or passages, or the pipes may be let into a hollow part of the bridge of the furnace. The air traversing through the pipes or passages becomes heated to a very high temperature. The hollow box or chamber is constructed as near to the back of the bridge as is convenient, and the top is provided with grates the width of the furnace. When the bridge is used for the purpose grates are provided at the top or other suitable part of the bridge; when the heated air therefore ascends through the grates either of the box, or chamber, or hollow bridge it will be diffused in such a manner as to come in contact with the whole volume of carbon passing over the bridge and convert it into flame before it can reach the chimney bottom.

SPECIFICATION in pursuance of the conditions of the Letters Patent, filed by the said John Botterill in the Great Seal Patent Office on the 2nd November 1866.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, John Botterill, of Leeds, in the County of York, Dyer, send greeting.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Second day of May, in the year of our Lord One thousand eight hundred and sixty-six, in the twenty-ninth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said John Botterill, Her special licence that I, the said John Botterill, my executors, administrators, and assigns, or such others as I, the said John Botterill, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "Improvements in Apparatus for Consuming Smoke," upon the condition (amongst others) that I, the said John Botterill, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said John Botterill, do hereby declare the nature of my said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement, reference being had to the Drawings hereunto annexed, and to the letters and figures marked thereon (that is to say):—

This Invention of "Improvements in Apparatus for Consuming Smoke" relates to a novel mode of arranging cast-iron or other pipes or air passages in combination with an air chamber or hollow bridge placed in the flue, fire-box, or other most convenient part of the furnace where it may be exposed to the heat of the fire, the object of the Invention being to admit heated air to the fire-box and cause it to commingle with the combustible gases evolved from the fuel for the purpose of more effectually burning the same. In adapting the Invention to locomotive engines the air supply pipes or passages are so constructed and arranged as to admit the air at either end so that in whichever direction the engine is travelling the air will be conducted to heating apparatus, and will be supplied under pressure to the fire-box, in which it will commingle with the combustible gases. In connection with these air pipes or passages is a hollow box or chamber to receive the air after it has passed through the pipes or passages ; or the pipes may be let into a hollow part of the bridge, or be adapted to or placed contiguous to the bridge of the furnace, as will be hereafter more fully explained. The air in traversing through the pipes or passages and the hollow box or chamber becomes heated to a very high temperature, and when it enters the fire-box and commingles with the heated combustible gases and smoke it will effectually consume the same, and thereby greatly economize the fuel.

In the accompanying Drawings Fig. 1, Sheet I., represents a longitudinal vertical section through the fire-box of a locomotive boiler, Fig. 2 being a transverse vertical section of the same constructed according to my improvements, or having my Invention adapted thereto. It will be seen that the Invention mainly consists in the use of an air chamber or hollow bridge B made of cast or wrought iron or other suitable material, and placed across the furnace A, just under the open ends of the tubes K of the boiler. This chamber or bridge is supplied with air by the tubes, pipes, or passages C at each side of the fire-box or furnace A. The pipes or passages C are supplied with air through an opening or valve D when the engine is running first, or at another opening E when the tender is running in front. These supply pipes run along the bottom of the ash-pan N until they meet at L, at which point there is a dividing piece or deflector which is carried up a short distance vertically for the purpose of deflecting the air upwards and causing it to ascend through the pipes C into the hot air chamber or bridge B. If preferred a tumbler valve may be used instead of the deflector. This valve will be placed vertically, and must be properly balanced so that whichever way the engine is running the air on entering the horizontal pipes or tubes *d* or *e* will act upon the valve and throw or force it over in the proper direction, thereby closing one pipe and opening the other. By this arrangement the air-supplying part of the apparatus will be self-acting, but if desired the tumbler valve may be actuated by means of a long rod and handle L, as shewn in the Figures. It will be seen that the supply pipes are so arranged that whichever way the engine may be running the air will be directed upwards. The vertical pipes C on each side of the furnace are carried through the grate bars G and through the fire, as shewn in the Drawing. The pipes are protected to a little above the height of the actual fire by the bricks or quarries F, which are made of fire-clay. The air in passing through the heated pipes C, C, into the air chamber or bridge B will be raised to a very high temperature, and on passing out at the opening H will be diffused in the fire-box in such a manner as to come in contact with the whole volume of the smoke or combustible gases before they pass over the air chamber or bridge B. These gases will thereby be converted into flame before entering into the tubes K of the boiler. When the engine is at rest the damper or valve M may be occasionally closed, and in order that air may be admitted into the pipes C holes are cut in the damper or valve M the size of the openings D, so that when the damper is closed it will not prevent air from entering the opening D.

In the event of it being necessary to shut the steam off suddenly in locomotive engines the great draught produced by the arrangement herein set forth might cause a counter draught below the fire outwards from the fire-grate, and burn the engineer or others on the engine. In order to prevent this counter draught I attach an arm or bar of iron to the damper which shuts the entrance of the fire-grate. This arm or bar is to be connected to the lever which shuts off the steam, and if desired this connection may be so made that the arm or bar may be attached to or detached from the shut-off lever at pleasure. By thus connecting this arm or bar to the damper, and also connecting it with the lever which shuts off the steam the same movement of the lever which would shut off the steam would simultaneously close the damper. This arm or bar should be kept connected to the lever whenever the engine is running at speed, and may be detached from the lever whenever the engine is stationary or engaged in shunting.

Fig. 3, Sheet II., is a longitudinal vertical section of a stationary boiler and furnace, with my Invention adapetd thereto. In this instance air is admitted to the ash-pit in the usual manner, and passes from thence along the air tubes E, which are placed in the flue behind the fire bridge. A return pipe D conducts the air to the air chamber B, which is fixed in the bridge and is provided with holes to allow the heated air to issue in thin streams or jets, and thus commingle with the heated vapors and gases arising from the fuel. The back plate of this hot air chamber is bent over so as to direct the air back into the fire-box, so that it may perfectly commingle with the combustible gases. It will be seen that by this arrangement the air before it issues from the chamber B will be highly charged with caloric, as it will in its passage along the pipes D and E absorb a good deal of the heat from the incombustible gases in the flue.

Fig. 4, Sheet III., represents a longitudinal vertical section, and Fig. 5 a plan view of a marine boiler and furnace constructed on the same plan s that shewn in Fig. 3 for a stationary boiler. The air passes in through the ash-pit, and after circulating through the pipes D and E in the flue behind the bridge enters the hot air chamber B, from which it issues through the long slots made in the top thereof, and is directed among the gases by the curved plate at the back edge of the chamber.

Fig. 6, Sheet II., is a longitudinal section of a marine boiler and furnace in which there is no fire-bridge. In this instance the box or chamber B extends along the back of the flue, and its exit openings are so arranged that the heated air as it issues will be intimately mixed with the combustible gases from the fire.

I would here remark that in order to effectually and economically consume all the combustible gases evolved from the fire it is essential that the air to support combustion in the flues should be heated to a high temperature, otherwise the gases will not be burnt. It has often been proposed to allow air from the ash-pit to pass up through passages in the bridge, but I have found that in so doing the air will not have time to take up sufficient heat, and that unless the channels or passages through which the air passes are exposed to the full heat of the fire or flame from the furnace, or unless these channels be of considerable extent, the air will not become sufficiently heated to effect the desired object.

Having now described my Invention of "Improvements in Apparatus for Consuming Smoke," and having explained the manner of carrying the same into effect, I would remark that by means of the above-described novel arrangement and construction of parts for supplying heated air to the fire-box and flues I am enabled to effectually consume the smoke and combustible gases evolved from the fuel, and therefore to greatly economize the fuel and at the same time raise steam more rapidly than heretofore. Sparks or flame will also be prevented from issuing from the funnel. What I claim as new in the above-described improvements is, the combination or arrangement of parts herein set forth for supplying heated air to the fire-box or furnace for the purpose of assisting in consuming the smoke and combustible gases evolved from the fuel.

In witness whereof, I, the said John Botterill, have hereunto set my hand and seal, the First day of November, in the year of our Lord One thousand eight hundred and sixty-six.

JOHN BOTTERILL. (L.S.)

Signed and sealed in
the presence of
JAS. WM. HAMILTON RICHARDSON,
Solicitor,
Leeds.

LONDON:
Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1866.

A.D. 1866, MAY 2, No. 1253,
BOTTERILL'S SPECIFICATION

(3 SHEETS)
SHEET 1.

FIG. 1.

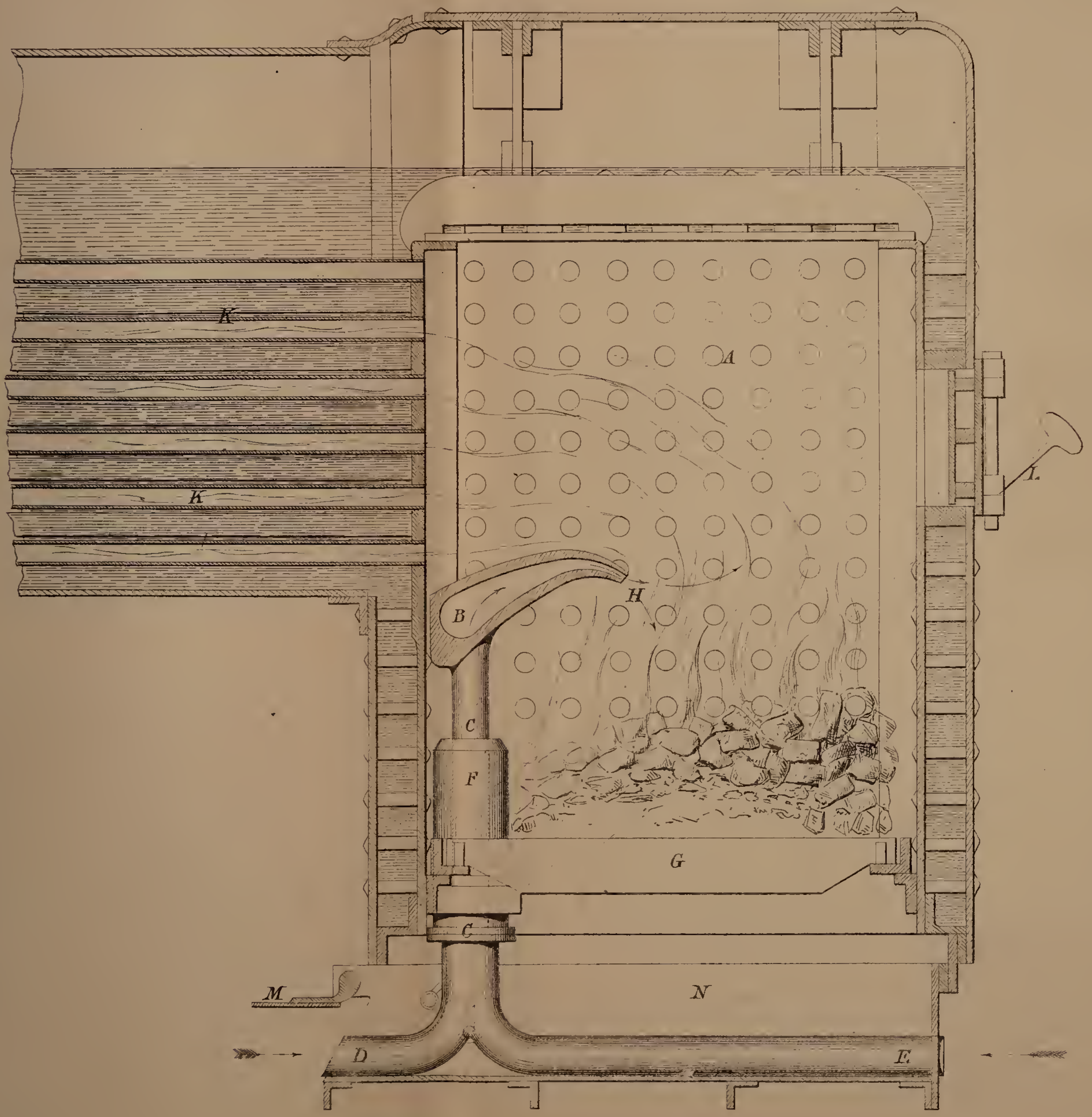
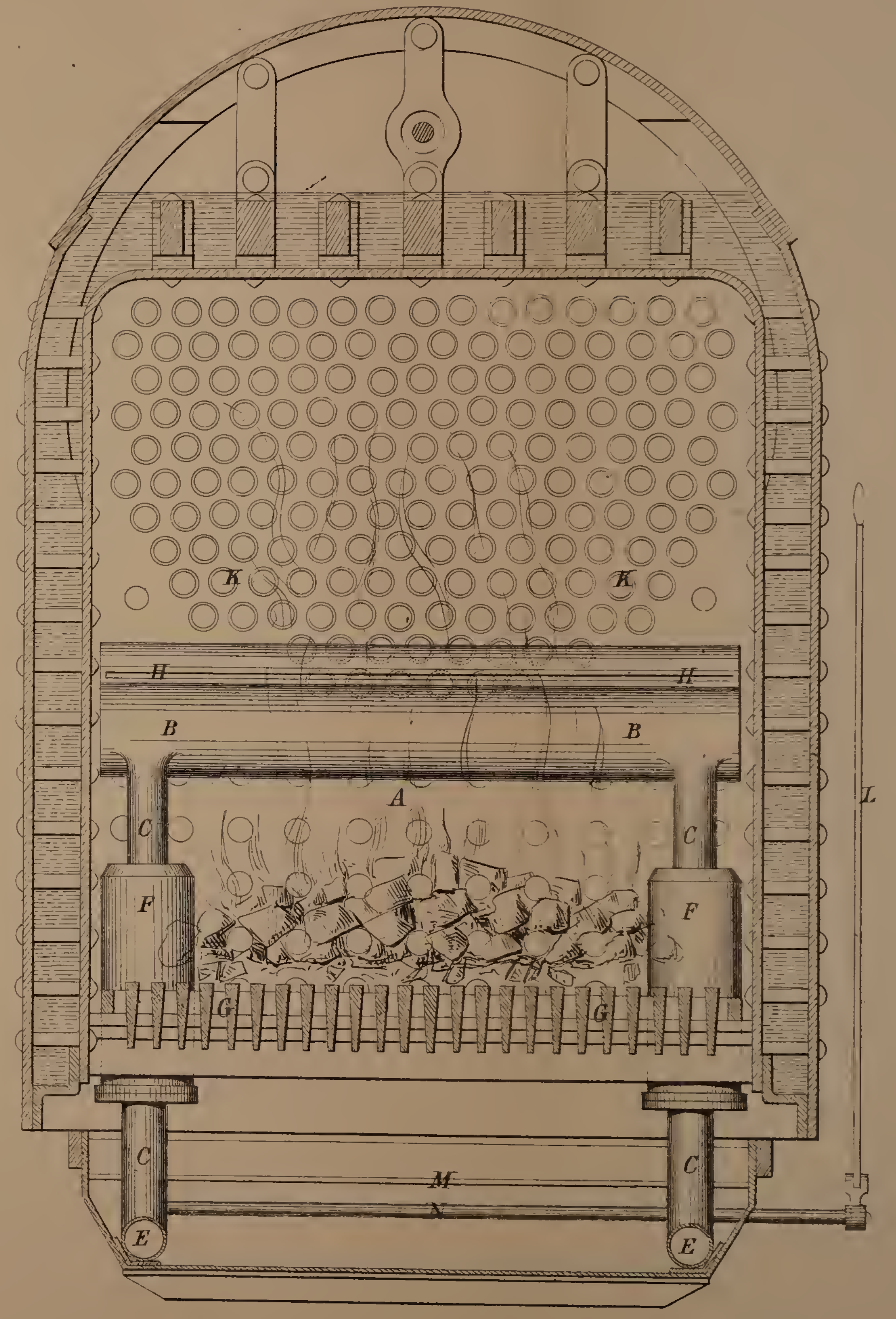


FIG. 2.



The filed drawing is partly colored

Drawn on Stone by Malby & Sons

LONDON: Printed by George Edward Eyre and William Spottiswoode,
Printers to the Queen's most Excellent Majesty. 1866.

FIG. 6.

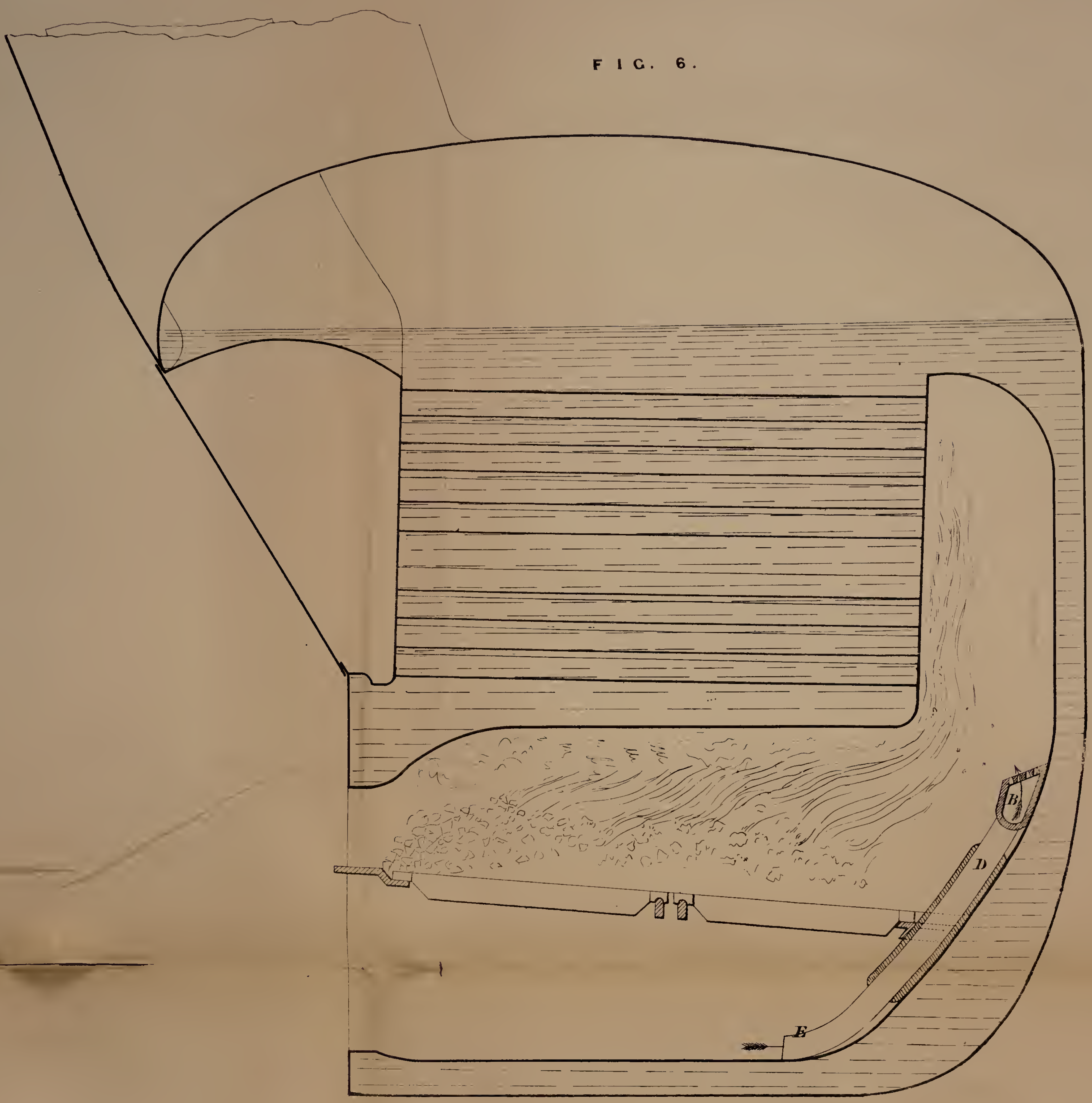
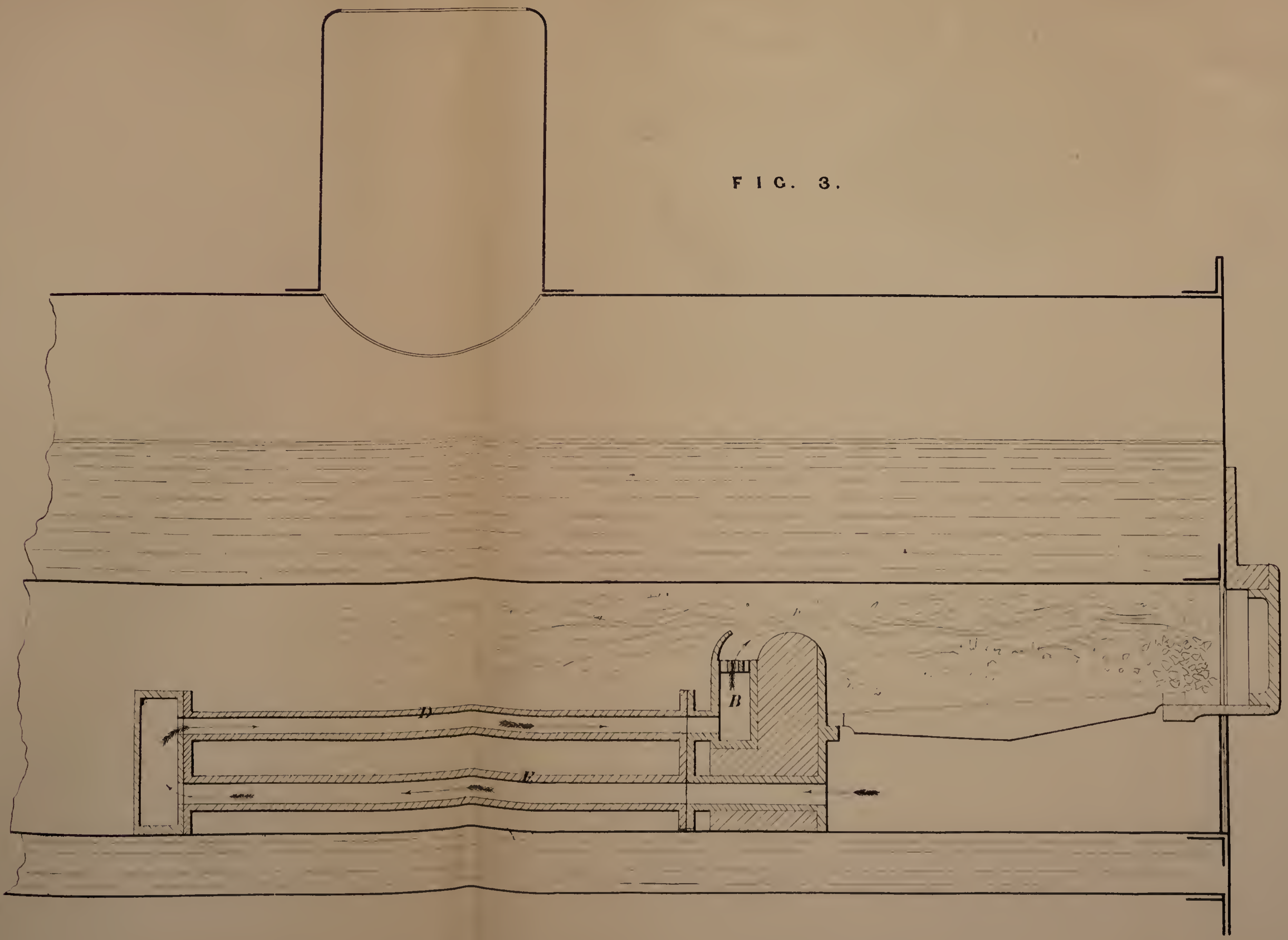


FIG. 3.



The filed drawing is colored.

Drawn on Stone by Malby & Sons.

LONDON: Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1866.

A. D. 1866. May 2. Nº 1253.
BOTTERILL'S SPECIFICATION.

(3 SHEETS.)
SHEET 3.

FIG. 4.

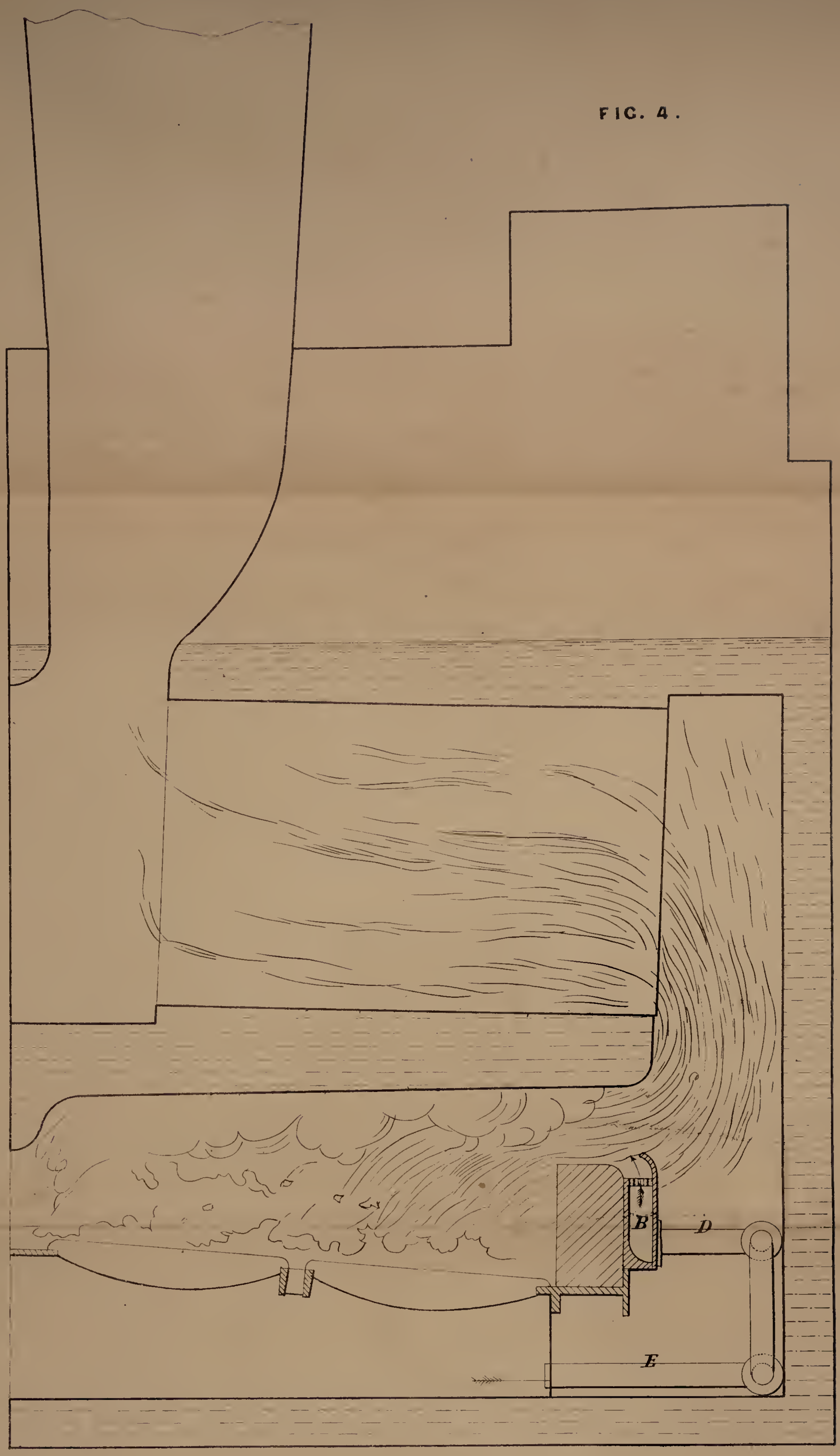
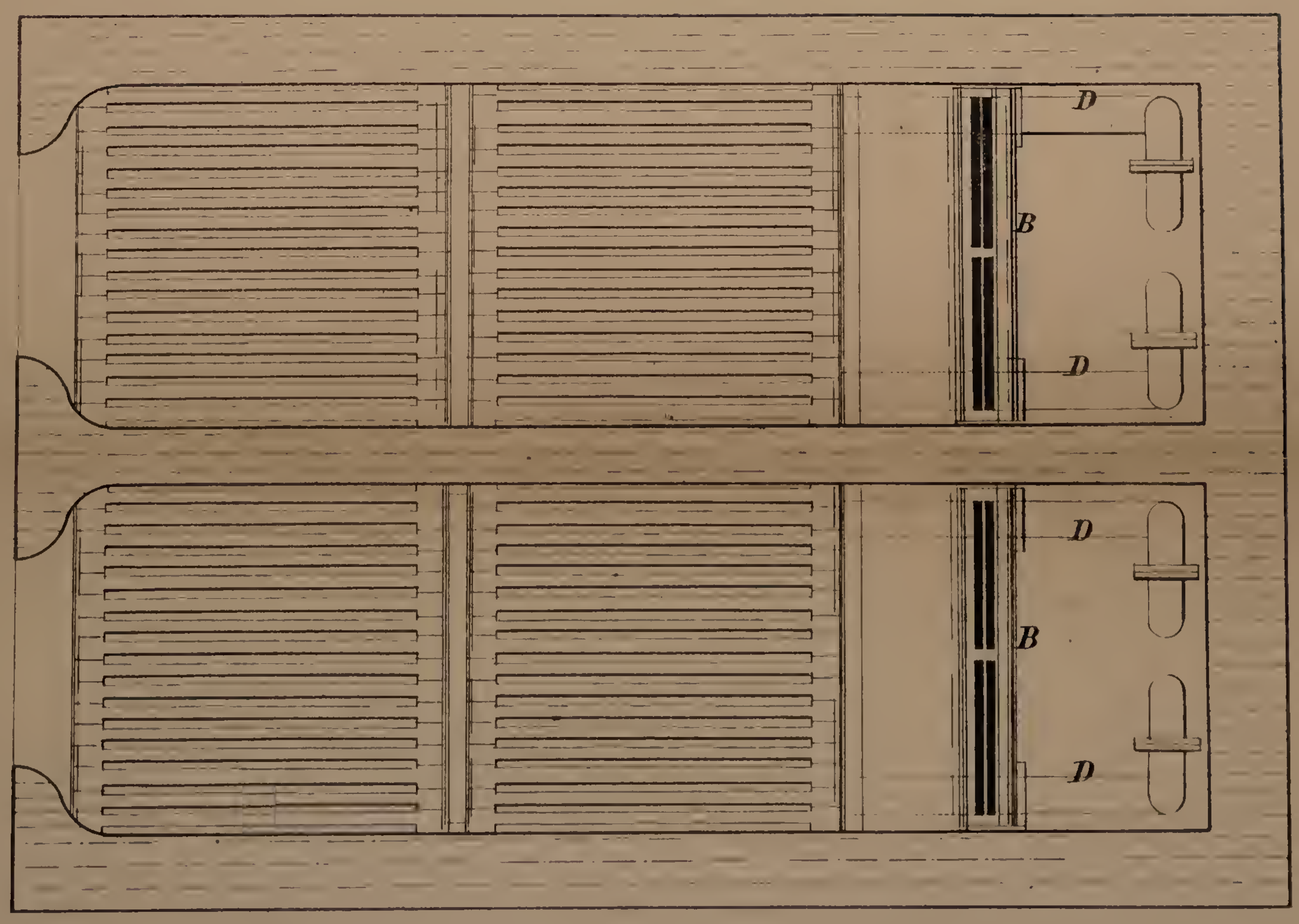


FIG. 5.



The filed drawing is colored.

Drawn on Stone by Malby & Sons.

LONDON: Printed by George Edward Eyre and William Spottiswoode
Printers to the Queen's most Excellent Majesty. 1866.